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EVALUATING OUTCOME OF SUPRAPATELLAR NAILING TECHNIQUE IN PROXIMAL ONE-THIRD SHAFT TIBIA FRACTURES

Orthopaedics

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ABSTRACT

BACKGROUND: The purpose of this study is to analyze the use of suprapatellar nailing technique as an effective measure to get near anatomical reduction in proximal 1/3rd fractures of tibia and document their clinical and functional outcomes. **MATERIALS AND METHODS:** This study was carried out under the Department of Orthopaedics, S.R.G. hospital Jhalawar. The study consists of 24 patients out of them 15 were Males and 9 were Females, of Unstable proximal tibia treated with Suprapatellar tibia Nailing available for follow up till one year which was taken as a basic pre-requisite for inclusion in the study. At each follow up, patients were evaluated clinically and radiologically with appropriate X-rays. **RESULTS:** Results were analysed by using modified rasmussen assesment at the end of 6 months shows excellent results in 54% (13) of patients, good results in 29% (7) patients, fair results in 13% (3) patients, and poor results in 4% (1) of patients. Postoperative complications are comparatively less in suprapatellar Proximal Tibia Nail as compared to the other alternative procedures. **CONCLUSION:** This article describes an operation method, and in addition to the benefits, potential risks with the method are shown. The method appears to be safe with no greater rate of complications compared with the traditional method, but clearly further studies with longer follow-up are necessary and in particular randomized studies comparing it with the previous gold standard treatment

KEYWORDS

Suprapatellar Nailing, Schatzker Classification, Fracture Proximal One Third Of Tibia

INTRODUCTION

Tibial shaft fractures are a common traumatic injury comprising roughly 2% of all fractures in adults.[1,2]

Locked intermedullary nailing currently is considered the treatment of choice for most open and closed tibial fractures as it preserves the soft tissue sleeve around the fracture site and allow early motion of the adjacent joints.[3]

The advantage of locked nailing in tibia lead to the expansion of its indication to include more proximal and distal fracture.

Traditional infrapatellar intramedullary nailing is a popular surgical procedure used in the treatment of tibial shaft fractures, as it is minimally invasive and allows for early functional rehabilitation.[4] However, this procedure may lead to proximal fracture fragment displacement with the knee in flexion, resulting in valgus and procurvatum.[5] With proximal fractures, there is a tendency for anterior malalignment of the proximal fragment from pull of the patellar tendon, and this pull is increased further when the knee is flexed during nailing.[6] With nailing in a conventional manner, there is a risk of poor repositioning, suboptimal reaming, and a poor placement of the nail.

Recently, the suprapatellar approach has attracted the attention of orthopedists, as it seems to offer fewer complications and re-operations. It is an approach that is modified from the semiextended approach proposed in 2000.[7] It is shown to facilitate reduction in knee fractures in a semi-extended position, and the extended position of the lower leg allows for easier fluoroscopic imaging.

Despite the challenges with different accesses and the risk of intraarticular damage, tibial nailing with the knee semi-extended through a suprapatellar entry appears to have become more widespread, and new instruments developed by different manufacturers have made the technique simpler and more secure.

AIM

The purpose of this study is to analyze the use of suprapatellar nailing technique as an effective measure to get near anatomical reduction in proximal 1/3rd fractures of tibia and document their clinical and functional outcomes.

MATERIALS AND METHODS

Sample size: All the cases of proximal 1/3rd tibia fractures fulfilling the inclusion criteria after getting approval from ethical committee will be taken up for the study.

Inclusion Criteria

1. Adult and adolescent male and female patients with proximal 1/3rd tibia fracture who have given their consent for the procedure.
2. Patients who are medically fit for surgery.
3. Closed and open fractures.

Exclusion Criteria

1. Children with age <12yrs.
2. Patients unfit for surgery.
3. Patients not willing for surgery.
4. Associated mid shaft and distal tibia fracture.
5. Associated with neurovascular injuries.

All the patients will be subjected to detailed history and clinical examination with emphasis on age, sex, mode of injury, fracture pattern, medical comorbidities, other associated bony injuries, duration of reporting after injury and time interval between injury and treatment.

A thorough clinical evaluation of affected limb will be carried out according to following points: attitude, pain, oedema, ecchymosis, deformity. Clinical examination will also include general, systemic examination and for associated injuries like head, chest- visceral injuries and other associated skeletal injuries.

Preoperative intravenous cephalosporin antibiotics will be given and continued at 12 hourly interval postoperatively for five days, and then switched to oral form till suture removal. In case of compound fractures antibiotics with wider spectrum and as per condition might be used.

OPERATIVE ANAESTHESIA
The patients will be taken up for surgery under Spinal aneathesia.

OPERATIVE TECHNIQUE
Preoperative evaluation: Patellar mobility of the injured leg is accessed so as to have sufficient space for instrumentation.

Patient position: supine on radiolucent table with knee roll to keep knee flexion of around 20-30degrees, c arm is placed on opposite side.

Technique: A 1.5-2cm longitudinal skin incision is made 1cm above the patella. By blunt dissection, quadriceps tendon is exposed which is split in midline. For optimal entry, a finger should be run under the patella. A ST pin of around 3.5mm size is then passed to make the entry which is located slightly lateral to the tibial spine on ap view and anterior to anterior articular margin on lateral view. After this then a protection sleeve is inserted and a proximal hand reamer is used over the ST pin to create the entry portal.

Now the ST pin is changed with the guide wire keeping the protection sleeve in place. Reduction is performed in the usual manner and guide wire is confirmed in the distal fragment by fluoroscopy. Sequential reaming is performed. Appropriate size nail is inserted over the guide wire, the nail is locked proximally through the zig or by free hand technique. Reduction and appropriate approximation of fracture fragment is confirmed and distal locking is done free hand. The joint is flushed with saline and closure in layers is done.

POST OPERATIVE MANAGEMENT
Immediate post-operative complications like fat embolism, compartment syndrome, neurological damage and vascular injury will be looked for. Intravenous antibiotic regimen was continued for 5 days after the surgery. Another 5 days of oral antibiotics were advised. Suture or staple removal will be done at 10-12th post-operative day.

Active quadriceps exercises are restarted on the 1st post-operative day with active ankle and toe movements with knee mobilization as far as the patient is comfortable and free of pain. The patients will be made to ambulate from the 3rd post-operative day without bearing weight on the operated leg with crutches or walker.

FOLLOW UP
Follow up will be done initially 4 weekly up to 3 months than 6 months (2nd week, 4th week, 8 week, 12 weeks, 24 weeks). Patients will be assessed clinically and radiologically findings.

Follow up anteroposterior and lateral radiographs will be reviewed for each postoperative visit. Partial and full weight-bearing will be allowed based on radiological and consolidation of the fractures. The fracture will be designated as united, when there was periosteal bridging callus at the fracture site at least in three cortices in the anteroposterior and lateral views. Trabeculations extending across the fracture site will also taken into consideration. These radiographies will be analysed for coronal and sagittal plane malalignment and shortening across fracture site. Patients range of motion of knee, ankle and limb length discrepancy, degree of pain or swelling documented. All operative and post-operative complications and secondary and unplanned procedures will be noted.

DISCUSSION
With SPN, it has become simpler to perform nailing of proximal tibial fractures. The indications for this technique are far more extensive, and it can also be used advantageously for shaft fractures and distal metaphyseal fractures. The method has significant advantages but also has potential risks that should be assessed. The main advantages are the simple positioning of the patient and the injured leg, which simplifies reduction of the fracture and the retention of this during nailing. When the leg is positioned stretched on the table, it also is easier to install blocking screws and position the C-arm when the distal screws are to be inserted, with no need for rearrangement. From experience in this method of nailing, the soft tissue is exposed to far less intraoperative trauma compared with traditional positioning, and it is possible that the risk of compartment syndrome is thereby reduced. Further advantages of the method are reduced need for an assistant and a shorter operating time. Concerns over the use of SPN include entry through a healthy knee joint and the risk of inflicting damage to the knee joint and, at worst, causing an infection in the joint. Despite this, today many retrograde femoral nailings and arthroscopies of the knee joint are performed without the same concerns. Jakma et al.3 operated on seven patients with SPN, four of whom had arthroscopy performed before or after nailing. In spite of the fact that unreamed nails were inserted and only the thinnest reamers were used to open proximally all showed signs of cartilage damage.3 In Tornetta and Collins'1 original series of 25 patients, one patient developed postoperative hemarthrosis, and two patients had minor cartilage abrasion.1 Later Ryan and Tornetta6 modified the method by nailing with the knee joint in 20-30 degrees flexion, changing the surgical entry to a smaller incision of 3-5 cm from the middle to the upper part of the patella, and performing the medial arthrotomy covering only the upper part of the retinaculum and 1-2 cm into the quadriceps tendon.6 Several manufacturers have now developed equipment for SPN in which protection sleeves protect against intraarticular damage. Sanders et al.7 operated on 55 patients with T2 (Stryker, Kalamazoo, MI) and Trigen (Smith and Nephew, Memphis, TN) nails with the suprapatellar approach. In 13 of 15 patients, arthroscopy was performed before and after nailing, and no cartilage changes were seen. One year after surgery, 33 patients had MRI performed with respect to cartilage damage, one had grade II patellofemoral changes and one had grade III changes, but there was no correlation between the arthroscopic changes, MRI scans, or the clinical examination.

In cadaver studies that examined the risk of intraarticular damage by the traditional infrapatellar entry, injury to the medial meniscus and the intermeniscal ligament has primarily been reported, but with less damage to the lateral meniscus and the footprint of the anterior cruciate ligament (ACL).5 Cadaver studies examining the injuries after nailing through a suprapatellar approach have shown similar injuries to the intermeniscal ligament and medial meniscus, but no violations were observed to the articular surface, lateral meniscus, or ACL, although Beltran et al.4 reported that the nail insertion in six out of 15 patients were in close proximity to the ACL insertion. Gaines et al., 8 in a cadaver study, compared the suprapatellar approach with the standard medial parapatellar entry and demonstrated a smaller rate of intraarticular injuries when using the suprapatellar approach. The risk of injury to anterior knee structures seems to be reduced by using an entry point within the safe zone, where the center is located 9mm ± 5mm lateral to midline of the tibial plateau and 3mm lateral to the center of the tibial tubercle, as described by Tornetta et al.

A major side effect of tibial nailing is anterior knee pain, with a mean incidence of 47% after 2 yr.9 The reasons for knee pain remain unknown, but it is reasonable to assume that surgical entry by nailing may be of importance. A retrospective study comparing SPN with standard nailing found no differences in the level pain.6 In a study of 37 patients operated with SPN there were no patients with anterior knee pain at 1-year followup.7 Rothberg et al.10 compared 18 patients with semi-extended tibial nailing with a control group of uninjured patients, and at 1 yr there was no increased incidence of anterior knee pain in the fracture group.

Suprapatellar nailing of tibial fractures is a simple method with many advantages over traditional tibial nailing. The method is still new and not yet widely used. There is room for development of the method and improvement of instruments, thus increasing safety and indications.

CONCLUSION
This article describes an operation method, and in addition to the benefits, potential risks with the method are shown. The method appears to be safe with no greater rate of complications compared with the traditional method, but clearly further studies with longer follow-up are necessary and in particular randomized studies comparing it with the previous gold standard treatment.

PRE OP X-RAY **POST OP X-RAY**

Figure. 1

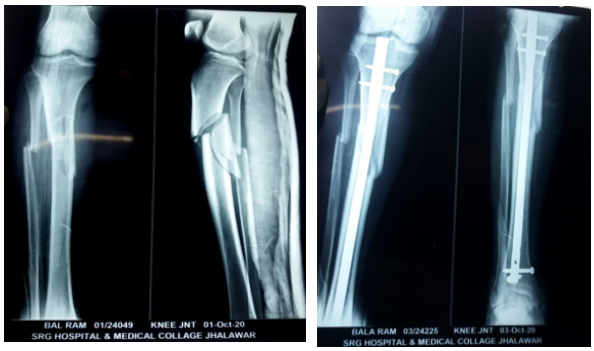


Figure. 2

Figure. 3

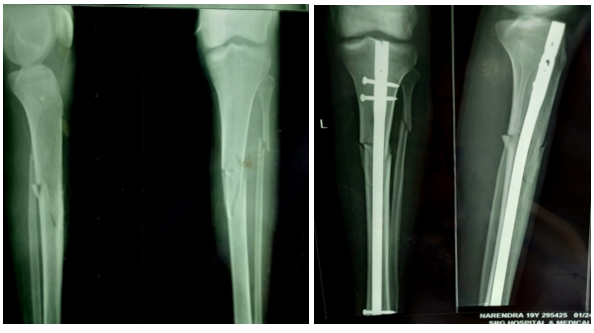
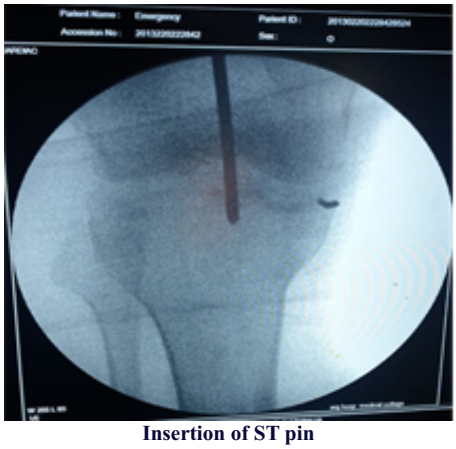


Figure. 4

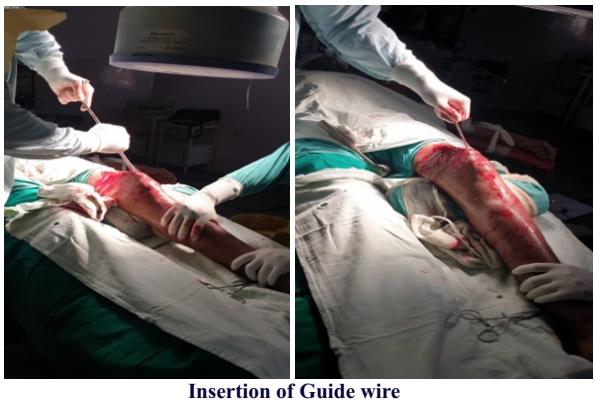
OPERATIVE STEPS

Incision

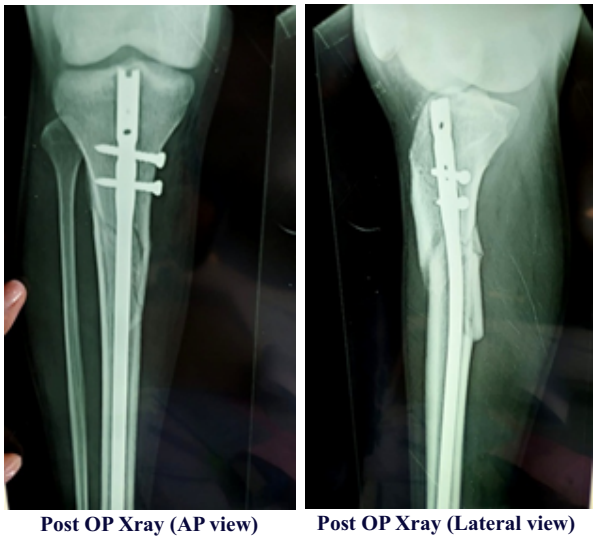


Insertion of ST pin

Insertion of Entry Reamer



Insertion of Guide wire



Post OP Xray (AP view) **Post OP Xray (Lateral view)**

Post op Knee in Extension

Post op Knee in Flexion

Post op Patient able to sit

Post op Patient able to squat

REFERENCES

1. Weiss RJ, Montgomery SM, Ehlin A, et al. Decreasing incidence of tibial shaft fractures between 1998 and 2004: information based on 10,627 Swedish inpatients. Acta orthopaedica 2008;79:526–33.
2. Larsen P, Lund H, Laessoe U, et al. Restrictions in quality of life after intramedullary nailing of tibial shaft fracture: a retrospective follow-up study of 223 cases. J Orthop Trauma 2014;28:507–12.
3. Campbell's Operative Orthopaedics , 12th edition ,volume 3, chapter 54, page 2650-2657
4. Bode G, Strohm PC, Sudkamp NP, et al. Tibial shaft fractures–management and treatment options. A review of the current literature. Acta Chir Orthop Traumatole Cech 2012;79:499–505.
5. Bhandari M, Tornetta P, 3rd, Sprague S, et al. Predictors of reoperation following operative management of fractures of the tibial shaft. J Orthop Trauma 2003;17:353–61.
6. Tornetta P, III, Collins E. Semiextended position of intramedullary nailing of the proximal tibia. Clin Orthop Relat Res. 1996; 328:185–189.
7. Hernigou P, Cohen D. Proximal entry for intramedullary nailing of the tibia. The risk of unrecognised articular damage. J Bone Joint Surg Br 2000;82:33–41
8. Jakma T, Reynders-Frederix P, Rajmohan R. Insertion of intramedullary nails from the suprapatellar pouch for proximal tibial shaft fractures. A technical note. Acta Orthop Belg. 2011; 77:834–837.
9. Beltran MJ, Collinge CA, Patzkowski JC, et al.. Intra-articular risk of suprapatellar nailing. Am J Orthop. 2012; 12:546–550.
10. Ryan SP 1, Steen B, Tornetta P III. Semi-extended nailing of metaphyseal tibia fractures: alignment and incidence of postoperative knee pain. J Orthop Trauma. 2014; 28:263–269.
11. Sanders RW, DiPasquale TG, Jordan CJ, et al.. Semiextended intramedullary nailing of the tibia using a suprapatellar approach: radiographic results and clinical outcomes at a minimum of 12 months follow-up. J Orthop Trauma. 2014; 28(Suppl 8):S29–S39.
12. Gaines RJ, Rockwood J, Garland J, et al.. Comparison of insertional trauma between suprapatellar and infrapatellar portals for tibial nailing. Orthopedics. 2013; 36:e1155–e1158.
13. Katsoulis E, Court-Brown C, Giannoudis PV. Incidence and aetiology of anterior knee pain after intramedullary nailing of the femur and tibia. J Bone Joint Surg Br. 2006; 88:576–580.
14. Rothberg DL, Daubs GM, Horwitz DS, et al.. One-year postoperative knee pain in patients with semi-extended tibial nailing versus control group. Orthopedics. 2013; 36:e548–e553.